

APPLICANT(S): TRIBELSKY, Zamir  
SERIAL NO.: 10/522,315  
FILED: September 22, 2005  
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#### **REMARKS**

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Applicant asserts that the present invention is new, non-obvious and useful. Prompt consideration and allowance of the claims is respectfully requested.

#### **Status of Claims**

Claims 1, 4 and 16-18 remain pending in the application. Claims 1, 4 and 16-18 have been rejected. Claim 1 was amended. Applicant respectfully asserts that the amendments do not add any new matter.

#### **INTERVIEW SUMMARY**

Applicants wish to thank Examiner Regina Yoo for granting and attending a telephone interview on June 15, 2010, with Applicants' representatives, Zeev Pearl, Reg. No. 60,234 and Naomi Liver. In the interview, US 2002-0079271 to Baca was discussed. Applicants have shown that total internal reflection of UV-radiation along the longitudinal trajectory of a stream of liquid is not disclosed or suggested by Baca. The Examiner indicated that amending claim 1 to recite the use of total internal reflection affirmatively and adding the element of "along the longitudinal trajectory of the stream" would overcome the current §102(e) rejection. Applicants have amended claim 1 accordingly.

#### **CLAIM REJECTIONS**

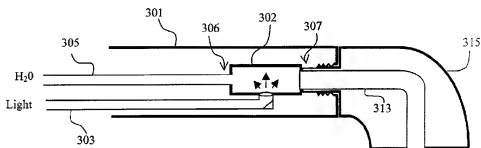
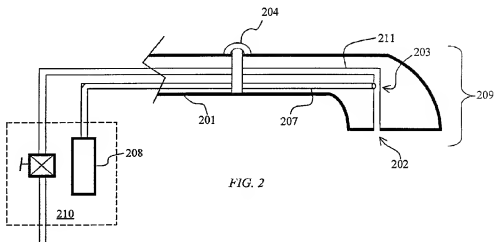
##### **35 U.S.C. § 102 Rejections**

Claims 1, 4 and 17-18 were rejected under 35 U.S.C. § 102(e) as being anticipated by Baca (US 2002-0079271). Applicants respectfully traverse the rejection.

Baca is directed to UV-treatment of water in a dental hand piece prior to entering the water into a patient's mouth. Water is streamed via a passageway or tubing within

the hand piece and enters a water treatment area and a fiber optic line and/or laser is optically coupled (for example, via a window) to the water treatment area for delivery of light (see par. 16).

Figs. 2 and 3 of Baca illustrating two configurations of the dental hand piece are reproduced below. As clearly demonstrated by the Figs. and par. 40-42, these configurations do not enable total internal reflection of the UV radiation along the longitudinal trajectory of the stream of the flowing liquid.



Moreover, as discussed during the telephone interview, the configurations of Figs. 2 and 3 do not enable total internal reflection. The phenomenon of total internal reflection can occur only when a light ray travels in a medium of a given refractive index

bounded by a medium of a lower refractive index above the critical angle. The critical angle for Total internal reflection is given by:

$$\arcsin (n_2/n_1)$$

where  $n_2$  is the lower refractive index of the less dense medium, i.e. air, and  $n_1$  is the refractive index of the denser medium, i.e. glass.

Total internal reflection will not occur when a light ray propagates from air to a transparent material having a higher refractive index but may occur when a light ray propagates from a transparent matter toward air if the light ray strikes the medium boundary and only if it strikes the boundary at an angle above the critical angle.

In Fig. 2, a passageway or tubing 211 for water and a fiber optic cable (207) are integrated within the hand piece. The fiber optic cable provides light from a laser source (208) to an interaction point (203) near the distal end of the hand piece. Baca discloses that the "end of the fiber optic cable can be optically integrated with the water tubing at the intersection point thus forming passage similar to a window through which light ... is allowed to illuminate and treat water flowing through the tubing at the point of integration (203)" (par. 40).

Baca clearly indicates that the illumination and treatment occur only at the point of integration (203). In fact, total internal reflection (TIR) is not enabled in this configuration as the physical conditions for the occurrence of TIR are not met. Firstly, the rays are entering from a medium of a lower refractive index into a medium of a higher refractive index. Secondly, by directing the UV radiation to a window on the wall of the water tubing which is not in the direction of flow of the water, a substantial portion of the rays would not hit the walls at the required angles to enable TIR.

In this configuration, even if a ray would hit the internal wall at the required angle, the ray would not be reflected back from the wall. As detailed above, the tubing and treatment area disclosed by Baca are not UV-transparent apart from a small window. Further, the tubing is not surrounded by air or another medium having a smaller refractive index than the water.

In Fig. 3, another dental hand piece is shown. In this configuration, a junction box (302) received water from water tubing 305. A fiber optic cable 303 is connected to the junction box from delivery of light from the laser source. Total internal reflection of the UV radiation within the flowing liquid is not enabled by the configuration of Fig. 3 for the same reasons detailed above. Clearly, the physical conditions for occurrence of TIR

are not met. Firstly, the rays are entering from a medium of a lower refractive index into a medium of a higher refractive index. Secondly, by directing the UV radiation to a window of the junction box not in the direction of flow of the liquid, a substantial portion of the rays would not hit the walls of the junction box at the required angles to enable TIR. Further, the junction box is not UV-transparent apart from a small window. Further, the tubing is not surrounded by air or another medium having a smaller refractive index than the water.

Baca further discloses at Par. 43, the use of a beam directing mechanism, such as a beam splitter or laser switching. A laser switch can allow the laser beam to be directed at only one target at a time, whereby a light switch can be activated by a user to allow water entering a patient's mouth to be treating prior to entering the mouth only when desired. This paragraph does not teach or suggest in any way the use of total internal reflection of the UV-radiation within a liquid waveguide.

Accordingly, Applicants respectfully assert that Baca does not teach or suggest at least, "disinfecting the steam of liquid by directing, within said stream of liquid, said UV-radiation such that said UV-radiation is being guided throughout said stream and the liquid to be disinfected serves as a flowing liquid wave guide for the UV-radiation along the longitudinal trajectory of the stream using total internal reflection", as recited by amended claim 1.

Accordingly, claim 1 and claims 4 and 17-18 dependent there on are patentable and thus allowable over Baca.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 1, 4 and 16-18 under 35 U.S.C. § 102(e).

### **35 U.S.C. § 103 Rejections**

Claims 1, 4 and 16-18 were rejected under 35 U.S.C. § 103(a), as being unpatentable over Baca in view of Neuberger (US 5658148) or Schneider (US 3,503,804).

Applicant respectfully traverses the rejections in view of the remarks that follow.

As discussed above Baca does not teach or suggest, at least, "disinfecting the steam of liquid by directing, within said stream of liquid, said UV-radiation such that said UV-radiation is being guided throughout said stream and the liquid to be

disinfected serves as a flowing liquid wave guide for the UV-radiation along the longitudinal trajectory of the stream using total internal reflection", as recited by amended claim 1.

Neuberger is not directed to UV-radiation. Neuberger discloses an oral cleaning device for destroying bacteria and viruses in the mouth and not for disinfecting liquid by ultraviolet. Rather, Neuberger teaches using a diode laser at a wave length of 904 nm (col. 1, line 26), 670 nm, 780 nm or 820 nm (col. 1, lines 49-52). As well known, none of these wavelengths are within the Ultraviolet range.

Schneider is directed to a method and apparatus for producing sonic or ultrasonic waves on a surface with a jet of water to mechanically remove dirt particles from the surface. The sonic or ultrasonic pulses or alternatively heat should be produced in the jet as close as possible to the surface to be cleaned. This can be achieved by focusing onto the surface a beam of parallel or converging energy coaxially with the liquid jet described as "clear water" (see column 2, lines 15-20). The method disclosed by Schneider does not require necessarily the use of ultraviolet radiation. In contrast, the Schneider reference specifically indicates that the radiation suitable for this cleaning method can be any radiation in the range between infrared and ultraviolet.

The liquid jet disclosed by Schneider serves as a medium for energy transfer and accordingly this "presupposes that the liquid does not offer any appreciable resistance to the radiation energy at least in the region of the jet length (clear liquid)" (see column 2, lines 35-38). Schneider further emphasizes that "In the case of a straight transparent liquid jet, the radiation propagating in it in the direction of its longitudinal axis is fully maintained up to the point of impingement of the liquid jet" (see column 2, lines 60-65).

Further, Schneider teaches that "The liquid jet is formed of clear liquid so as not to constitute any resistance to the radiation energy of the beam" (emphasis added, see column 3, lines 73-75 of Schneider).

The mere fact that a reference discloses the well-known phenomenon of a liquid wave-guide or total internal reflection does not suggest "disinfecting the stream of liquid by directing, within said stream of liquid, said UV-radiation such that said UV-radiation is being guided throughout said stream and the liquid to be disinfected serves as a flowing liquid wave guide for the UV-radiation along the longitudinal trajectory of the stream using total internal reflection", as recited by amended claim 1.

As discussed above, total internal reflection of UV radiation within a liquid occurs only under certain conditions and it is not an inherent characteristic of any form of radiation of liquid. Applicants respectfully assert that it would not be obvious to modify the teaching of the Baca reference, which does not teach or suggest the use of total internal reflection, not per se and not along the longitudinal trajectory of a stream with either the teaching Neuberger or Schneider and to come up with a new method for ultraviolet (UV) liquid disinfection that includes "disinfecting the stream of liquid by directing, within said stream of liquid, said UV-radiation such that said UV-radiation is being guided throughout said stream and the liquid to be disinfected serves as a flowing liquid wave guide for the UV-radiation along the longitudinal trajectory of the stream using total internal reflection" as recited by claim 1, as amended.

Applicant further asserts that independent claim 1 is allowable over the combination of Baca and Schneider as well as over the combination of Baca and Neuberger.

Each of dependent claims 4 and 16-18 depends, directly or indirectly, independent claim 1, and includes all the features of the claim from which it depends as well as additional distinguishing features, and is therefore allowable.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 1, 4 and 16-18 under 35 U.S.C. § 103(a).

### **CONCLUSION**

In view of the foregoing amendments and remarks, Applicant asserts that the pending claims are allowable. Their favorable reconsideration and allowance is respectfully requested.

Should the Examiner have any question or comment as to the form, content or entry of this Amendment, the Examiner is requested to contact the undersigned at the telephone number below. Similarly, if there are any further issues yet to be resolved to advance the prosecution of this application to issue, the Examiner is requested to telephone the undersigned counsel.

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Please charge any fees associated with this paper to deposit account No. 50-3355.

Respectfully submitted,



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